Spring 2022

PHYS 433-002: Electromagnetism II

Andres Jerez

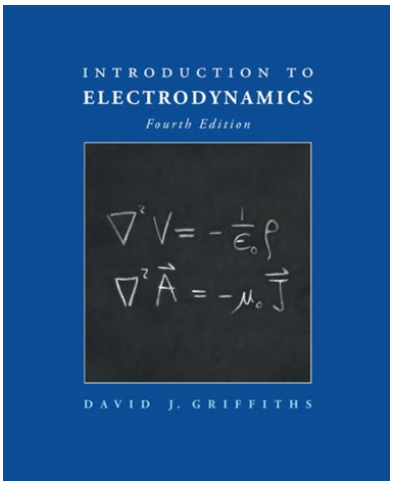
COURSE OUTLINE **PHYS 433 002: ELECTROMAGNETISM II** **CRN: 14758** **Spring 2022**

Instructor: **Andres Jerez**: **jerez@njit.edu**

Lecture Times: Tuesdays and Thursdays, 4:00 PM – 5:20 PM, FMH 310
(Synchronous Online, via Webex, until 1/31)

Office hours: Wednesdays, 12:00 PM – 1:00 PM, TIER 455, and by appointment.

TEXTBOOK: *Introduction To Electrodynamics*, 4th Edition, David J. Griffiths, Pearson, ISBN-13: 9 8-0-321-85656-2, ISBN-10: 0-321-85656-2



ELEMENTS OF THE COURSE:

CANVAS: The Learning Management System at NJIT is Canvas . Lecture notes, quizzes, grades, exams, and additional course material will be managed through Canvas.

Notice: Classes will be online, via Webex, until 1/31. I will send a link to the Webex Meeting before each class.

EXAMS:

- **Midterm Exam:** There will be an in-class midterm on *Thursday, March 10*, covering chapters 7 – 9. The exam will contain six open-ended problems, each worth 10 points for a total score of 60 points. The exam will be administered within Canvas, including the submission. The format is open textbook but closed notes.

- **Final Exam:** A final exam will be given during the final exam period (TBA), covering chapters 10 – 12. The exam will contain six open-ended problems, each worth 10 points for a total score of 60 point. The exam will be administered within Canvas, including the submission. The format is open textbook but closed notes.

QUIZZES: Starting on January 25, a lecture quiz will be given by the end of every Tuesday class. The quiz will contain 1 – 5 problems depending on the level of difficulty. The quiz will be graded and discussed in the following lecture. The quizzes will be open textbook but closed notes.

HOMEWORK: No formal homework will be assigned; however, the syllabus lists suggested practice problems that a student should attempt to solve. Problems for the lecture quizzes, midterm, and final exam may be (but do not have to be) selected from the suggested problems.

GRADING: Lecture Quizzes, 40%; Midterm, 30%; Final Exam, 30%.

The cutoff percentages for various letter grades will be in the range of:
85% for A; 80% for B+; 70% for B; 65% for C+; 50% for C; 40% for D; F below 40 %

Final grades are not negotiable: A score of 84.999999% is a B+, not an A.

LAST DAY TO WITHDRAW: April 4th

HONOR CODE STATEMENT: NJIT has a zero-tolerance policy for cheating of any kind and for student behavior that disrupts learning by others. Violations will be reported to the Dean of Students. The penalties range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT. Avoid situations where your own behavior could be misinterpreted as dishonorable. **Students are required to agree to the NJIT Honor Code on each exam, assignment, quiz, etc. for the course.**

- Statement on Academic Integrity:
    - ***"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.***

      Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*

HELP: Contact your instructor if you are having trouble with the course; do not simply hope for a miracle and fall further behind.

LEARNING OUTCOMES:

- Describe the electric currents in conductors due to electric fields using Ohm's law.
- Describe electromagnetic induction due to changing magnetic fields. Calculate the induced electric field in a number of situations using Faraday's law.
- Recognize Maxwell's equations as the complete and unified description of electromagnetism. Describe the meaning of the different terms in the equations and the expression of Maxwell's equations in the presence of matter.
- Describe the conservation of charge. Evaluate energy, momentum, and angular momentum of radiation in certain situations.
- Identify electromagnetic waves as solutions of Maxwell's equations. Describe the propagation of these waves both in vacuum and in matter. Explain polarization of waves.
- Describe electromagnetic phenomena using advanced and retarded potentials. Use potentials to describe the field generated by a moving point charge.
- Analyze the electromagnetic dipolar radiation generated by a distant radiating source.
- Calculate physical properties in situations where the Special Theory of Relativity is relevant. Explain why Electromagnetism is a Relativistic Field Theory.

Class Calendar

Date	Topic	Reading Material	Suggested Problems
1/18	Electrodynamics	Ch. 7.1	Ch. 7: 1, 2, 4, 5, 6, 7
1/20	Electrodynamics	Ch. 7.2	Ch. 7: 12, 13, 15, 16, 21, 22, 23, 26, 28, 30, 33
1/25	Electrodynamics	Ch. 7.3	Ch. 7: 34, 35, 36, 40
1/27	Electrodynamics, problem solving	Ch. 7.1-7.3	*Ch. 7: 41, 43, 44, 47,54, 57, 58, 62*
2/01	Conservation Laws	Ch. 8.1	Ch. 8: 1, 2
2/03	Conservation Laws	Ch. 8.2	Ch. 8: 3, 4, 5
2/08	Conservation Laws	Ch. 8.2	Ch. 8: 6, 7, 9
2/10	Conservation Laws	Ch. 8.3	Ch. 8: 11, 12
2/15	Conservation Laws, problem solving	Ch. 8.1-8.4	*Ch. 8: 13, 14, 15, 16, 17, 22*
2/17	Electromagnetic Waves	Ch. 9.1	Ch. 9: 2, 3, 4, 8
2/22	Electromagnetic Waves	Ch. 9.2	Ch. 9: 9, 10, 11, 12, 13
2/24	Electromagnetic Waves	Ch. 9.3	Ch. 9: 14, 15, 17, 18
3/01	Electromagnetic Waves	Ch. 9.4	Ch. 9: 19, 20, 21, 22, 23, 25, 26
3/03	Electromagnetic Waves	Ch. 9.5	Ch. 9: 27, 28, 29, 30, 32
3/08	Electromagnetic Waves, problem solving	Ch. 9.1-9.5	Ch. 9: 35, 36, 39, 40
3/10	***Midterm (Chapters 7, 8, & 9)***		
	Spring Break		
3/22	Potentials and Fields	Ch. 10.1	Ch. 10: 1, 2, 3, 4, 7, 8
3/24	Potentials and Fields	Ch. 10.2	Ch. 10: 10, 11, 12, 13
3/29	Potentials and Fields	Ch. 10.3	Ch. 10: 15, 16, 19, 20, 21, 22
3/31	Potentials and Fields, problem solving	Ch. 10.1-10.3	Ch. 10: 24, 28, 30, 31, 32
4/05	Radiation	Ch. 11.1	Ch. 11: 2, 3, 4, 5, 8, 10, 11
4/07	Radiation	Ch. 11.2	Ch. 11: 12, 13, 14, 17, 18
4/12	Radiation, problem solving	Ch. 11.1-11.2	Ch. 11: 22, 24, 25, 26, 28, 34
4/14	Electrodynamics and Relativity	Ch. 12.1	Ch. 12: 3, 5, 7, 8
4/19	Electrodynamics and Relativity	Ch. 12.1	Ch. 12: 16, 18, 19, 20
4/21	Electrodynamics and Relativity	Ch. 12.2	Ch. 12: 24, 25, 28, 33,34, 37, 39, 41
4/26	Electrodynamics and Relativity	Ch. 12.3	Ch. 12: 42, 43, 44, 45, 47, 48
4/28	Electrodynamics and Relativity	Ch. 12.3	Ch. 12: 50, 51, 53, 54, 56, 67, 69

Spring Break: March 14th to March 19th
Good Friday, April 15th, <u>No Class</u>
<u>Tuesday, May 3rd, follows Friday schedule</u>
LAST DAY TO WITHDRAW: Monday, April 4th
LAST DAY OF CLASSES: Tuesday, May 3rd
READING DAYS: May 4th and 5th
FINAL EXAM PERIOD: May 6th – May 12th